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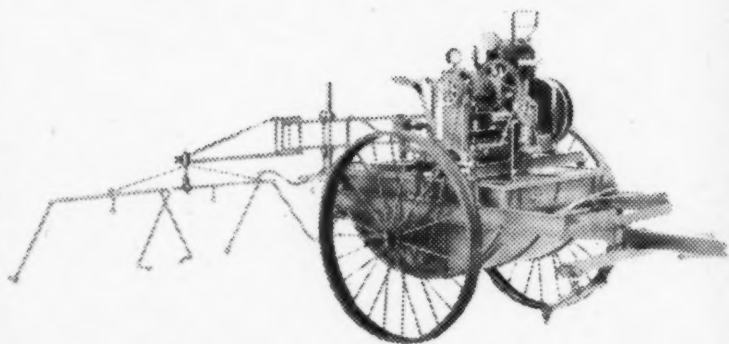
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# AMERICAN POTATO JOURNAL

PUBLISHED BY

THE POTATO ASSOCIATION OF AMERICA

EAST LANSING, MICHIGAN

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## Soil Reaction and the Potato Crop

WM. H. MARTIN

Experiment Station, New Brunswick, N. J.

Ten years ago common scab was the most serious disease of the potato in New Jersey. In many fields this disease was so prevalent as to render a large part of the crop unfit for the market. At that time it was pointed out that the only satisfactory method of eliminating scab was to change the soil reaction by the use of sulphur or sulfate of ammonia to a point where the organism causing scab would not develop. It was pointed out at that time that while this was very desirable both from the standpoint of crop returns and the control of scab, it would be necessary to watch the situation carefully and upon the first indication of excessive soil acidity the use of large amounts of sulphate of ammonia would have to be discontinued. This point has now been reached in some fields and it is imperative that the potato grower give the matter serious consideration. While few cases have been observed where yields were seriously reduced from too acid conditions, it is true that a number of fields have been observed which are just on the border line and the use of acid producing fertilizers for a few more years will result in considerable injury to the crops.

Several cases of excessive acidity were observed on Long Island last summer. In one field, for example, the plants were small and the lower leaves yellow. An examination of this soil showed an extremely acid condition. The situation on Long Island is much the same as in New Jersey, although it is apparently more acute there. In order to decrease acidity a number of Long Island growers are broadcasting small

amounts of lime, while certain of the fertilizer mixers are selling an alkaline fertilizer; using 100 to 300 pounds of lime in each ton of fertilizer.

P. H. Wessels of the Research Farm at Riverhead has conducted a series of experiments with potatoes to determine the influence of soil acidity on the development of scab as well as on yield. Potatoes were planted on a series of plots having a wide range of acidity. He concluded that best yields are likely to follow where the soil reaction is just sufficiently acid to control scab. He also found from a study of a number of potato fields on Long Island that scab is seldom serious where the reaction is more acid than pH 5.3, though a few exceptions were noted, especially where lime had been used some years previously. His tests indicated also that where the reaction of the soil became less acid than pH 5.7 there was a tendency for the yields to decrease. In connection with his studies it is of interest to note that Irish Cobbblers were planted in 1926 and, regardless of the soil reaction, they were free from scab. In 1927 the same plots were planted with the Green Mountain variety and on some of the plots from 40 to 70 per cent of the crop was unsalable. Green Mountains were planted on a second series of plots for the first time in 1928 and despite the fact that some showed pH values as high as 6.3, scab was of very little importance. The results obtained on the first series of plots in 1926 and 1927 and the results of the experiments reported below would suggest that if the second series of plots had been planted in potatoes in 1929, scab would have been severe.

This is an important point and one on which we have just secured additional information. The question has frequently been asked, "What would happen if potato soils which had been made acid to exclude scab were restored to their former reaction by the addition of lime?" We now have a definite answer to that question and we believe we are safe in saying that in the case of most any potato field in New Jersey, the addition of a sufficient amount of lime to bring the pH up to higher than approximately 5.7 will result in a serious scab infection.

We know now that when the soil is made sufficiently acid as to prevent the development of scab on the potato crop, we do not destroy the scab organism, but merely prevent its development. This is clear from the results of several experiments recently conducted in the greenhouse. Soil for these studies was taken from a field which had for several years produced a crop of American Giants so badly scabbed as to render them almost unsalable. By the use of sulphur, as well as by using sulphate of ammonia in the fertilizer, the acidity

was finally adjusted to a point where clean crops of the Irish Cobbler variety were grown. When this soil was brought to the greenhouse it showed a pH value of 5.1. It was divided into eleven lots of five pots each and each of the eleven lots received a different treatment, including lime, sulphur, sulphate of ammonia, and nitrate of soda. Only the pots receiving lime need be mentioned here. Four series received hydrated lime at the rate of 1,000, 2,000, 3,000, and 4,000 pounds per acre. Irish Cobbler potatoes were planted in these pots. The seed was free from scab and to make certain that the organism was not present it was disinfected in mercuric chloride for one and a half hours. When the first crop of potatoes was harvested only two small scab spots were found on the tubers and they were confined to the high lime pots, although the reaction of the cultures receiving lime was satisfactory for the development of scab. A second lot of clean Irish Cobbler seed potatoes was then planted in these same pots after the first lot was harvested. The results of the second planting are shown in Table 1.

TABLE 1

Treatment	pH Values	Per Cent Clean Potatoes
Fertilizer alone	5.0	100.0
Fertilizer and 1000 lbs. lime	5.3	88.9
Fertilizer and 2000 lbs. lime	5.8	42.9
Fertilizer and 3000 lbs. lime	5.9	37.5
Fertilizer and 4000 lbs. lime	6.4	46.2

It will be seen that while the use of lime failed to produce a scabby crop on the first planting of potatoes, the second crop was severely scabbed, especially in the high lime series. These results clearly show what can be expected to happen when an excessive amount of lime is used where potatoes are to be grown. The fact that a clean crop is grown now does not mean that the scab organism is not present in the soil, but probably indicates that the soil acidity is too great to permit of its development. When lime is applied and the acidity decreased as the result of the treatment, conditions favorable for the development of the scab organism are promoted in the soil. If the lime is applied just ahead of the potato crop the soil reaction may not be changed sufficiently early to result in infection, but what is possibly more important is the fact that it probably requires some time for the scab organism to build up in numbers and virulence to a point



where it attacks the potato. The use of excessive amounts of lime on our potato soils is then, to be very much avoided.

Further information on the relation of soil reaction and the development of scab is available from the results of tests conducted on the J. Harry Kandle farm at Elmer. In these tests potatoes were grown over a period of years on the same plots. These plots, 96 in all, received different fertilizer applications and half were given two applications of sulfur in three years, while the other half received no sulfur. In Table 2 are presented the results of these tests for the years 1920, 1921, 1922, and 1924. The figures given represent the average for these four years. The first column shows the number of plots having a definite range of pH values. In the case of the first figure, for example, this means that 46 plots in the four-year period had pH values between 4.3 and 4.5 with an average of 4.41. In this connection it should be said that this is extremely acid.

TABLE 2

No. of Plots	Average pH Value	Unsalable Potatoes Per Cent	Bushels per Acre Salable Potatoes
46	4.41	2.9	186.4
56	4.72	3.0	208.6
38	4.97	6.4	222.9
31	5.34	8.0	233.7
50	5.62	10.0	196.1
93	5.85	25.8	167.3
29	6.15	42.7	110.1
15	6.45	55.4	104.1

It is clear from the table that as the pH values increase, i. e., as the soil acidity decreases the number of unsalable potatoes due to scab increased. In this connection it should be said that a potato showing more than five scab spots per tuber was placed in this group. In the case of the plots with a low acidity most of the tubers were almost entirely covered with deep scab spots, while on those plots with high acidity the spots were unusually small and inconspicuous. In the case of the plots with highest acidity, for example, 87 per cent of the potatoes were entirely free from scab as compared with only 20 per cent on the plots with lowest acidity. This means that nearly all, if not all, of the potatoes from the former plots would have gone into U. S. Grade No. 1, while in the latter case it would have been extremely difficult to sort any of the potatoes to meet the requirements of this grade.

The influence of soil reaction on scab and the potato crop is

best seen from a consideration of the last column of the table showing the yield of salable potatoes, i. e. those which were entirely clean together with those having less than five scab spots. It is true that the severely scabbed potatoes have some value but it is certain that their presence in any number will result in a loss rather than in a profit on the investment. Largest yields of salable potatoes followed from those plots with pH values between 5.2 and 5.4 with an average of 5.34 for the 31 plots. Where the pH values fell below 4.9 there was an appreciable reduction in yield of salable potatoes due to the fact that the yield of all tubers was likewise reduced on these plots. Where the pH values were increased above 5.5 also there was a reduction in yield of salable potatoes. With an average pH value of 5.34, for example, the yield was 233.7 bushels of salable potatoes as compared with 104.1 bushels for the plots with an average pH value of 6.45. Not only was there a reduction in yield of salable potatoes as the soil acidity decreased, but the total yield of all tubers showed a tendency to decrease. Largest total yields followed on those plots giving largest yields of salable potatoes, suggesting that in a soil with a pH value of 5.0 to 5.4 scab will be of little consequence and at the same time this reaction is apparently best adapted to the potato. While the data at hand does not warrant a definite statement to the effect that as the soil reaction is decreased, total yields will likewise decrease, the results of these experiments, as well as those conducted by Wessels on Long Island, would suggest this to be true. While there is a question as to this point, there is no doubt but that decreasing soil acidity to above 5.4 will result in a considerable increase in scab and this in turn will result in an appreciable decrease in the yield of salable potatoes.

The results of these tests, demonstrate that the scab organism is probably present in all potato soils and that if excessive amounts of lime are used a scabby crop will result. The other point of interest resulting from this work is the fairly narrow range in soil reaction best adapted to potato culture both from the standpoint of scab and yield. Our present information would suggest that for best results, from the standpoint of yield and particularly of freedom from scab, the soil reaction should be maintained between pH 5.0 and 5.4. Below 5.0 a reduction in yield will follow, while above 5.4 there will be an increase in scab with a possibility of reduced yields. Since this is true it is important that the potato grower give some attention to the reaction of his soil. Where the reaction is below pH 5.0 it would be advisable to use lime, but it should be used with caution if potatoes are to be grown. Never proceed on the assumption that lime is cheap and if a little is good a lot is better. This rule is almost certain to result in a scabby crop. We believe also that where lime is used it should be broadcast before planting the

crop rather than applying it in the fertilizer. It should be pointed out also that where the soil reaction has been adjusted to the desired acidity, the grower should discontinue the practice of obtaining most of the nitrogen from sulfate of ammonia. Where this condition exists it would be advisable to obtain part of the nitrogen from nitrate of soda and the remainder from sulfate of ammonia. By doing this the soil acidity will not be further increased and difficulty will be avoided.

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## The Place of Grades and Standards in Potato Marketing\*

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WELLS A. SHERMAN, Bureau of Markets, U. S. D. A. Washington, D. C.

A mandatory set of potato grades for nationwide use was thrust upon the industry and universally by the Food Administration. Whether the potatoes shipped after these grades were prescribed by the Food Administration did or did not actually comply with the U. S. grades, nevertheless these grades became the basis of trading and all disputes and adjustments resulting from questions of quality were determined on the basis of these grades. Broadly speaking, this has been the case ever since. When potatoes are bought, if no other grade or quality is specified, it is assumed that U. S. No. 1 is to be delivered. However many thousands of cars are still shipped which are below the requirements of this grade but which are very much better than U. S. No. 2. A few states have prescribed combination grades to take care of such lots but throughout the greater part of the country they are bought and sold under the presumption that they are U. S. No. 1. Whenever a receiver rejects a car and claims that the quality is not satisfactory the inspection is on the basis of U. S. No. 1. If the potatoes are found to be below the requirements of that grade the receiver can usually secure an adjustment or reduction of price. I know of no other product in the case of which so many transactions are made presumably on the basis of a grade while so large a proportion of actual deliveries are below the requirements of that standard.

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\*Paper read before New Jersey Potato Association, Trenton, N. J., Jan. 29, 1931.



There is, however, steady improvement in this situation. A considerable part of the potato crop of the United States moves over long distances. I believe that no where else in the world are so many potatoes shipped so far by rail as in the United States. There are many years in which our crop is short in one part of the country or another, and an occasional year in which it is generally short for the country as a whole. Under these conditions there is a great deal of selling f. o. b. shipping point, while in some regions most of the crop is sold on this basis almost every year. Shippers generally wish to take advantage of a situation which is favorable to f. o. b. sales at good prices and such sales cannot be made with any assurance that the prices stipulated will actually be made unless the trading is on the basis of a grade which the shipper can actually deliver. This situation alone has tended to make a fairly efficient grading of the crop imperative in a great many sections.

Potatoes are one of the great staple crops of the country. The size of the crop, its exact time of maturity in different sections, the injury which it may receive from drought or flood or frost, the rate of car loadings in producing areas, the amounts received for unloading in the different markets, the prices prevailing f. o. b. shipping point and delivered prices in the markets, the rate of movement into consumption, the quantities held in storage at certain periods of the year, are all matters of direct and immediate concern to an immense number of growers and a very large number of traders in localities scattered over almost the entire arable area of the United States.

If prices are to be quoted officially and intelligently and are to be understood by growers and dealers throughout the land they must be made upon grades which are understood by all those who must use or be guided by the quotations. If sales made in New Jersey for delivery in Chicago are to be consummated with satisfaction to both parties there must be a meeting of minds in advance concerning the quality of the potatoes to be shipped. If there is any dispute as to this quality congress has provided through our bureau the machinery by which a disinterested inspection may be made and a certificate obtained which is prima facie evidence of the facts either in a United States court or in a procedure before the Secretary of Agriculture under the recently passed Perishable Agricultural Commodities Act. If these inspections are to be satisfactory and the resulting certificates intelligible, uniform, and defensible they must be based upon definite specifications of quality. Such specifications are afforded by the recommended U. S. grades.

Thus, as our marketing machinery and the agencies which

aid in its functioning become more comprehensive and intricate, grading becomes more and more fundamental to the entire enterprise, operation, or industry.

In an effort to help the situation a number of states have legislated on the subject. The general trend and effort of this legislation is to compel shippers actually to grade their potatoes to conform to the recommended U. S. grades or to similar grades established by the state. In some cases the grading has not been made compulsory but provision has been made for an official inspection of them before they may be moved out of the state. This inspection is compulsory and for a fee. Such legislation amounts of course to a tax on the industry, a tax which each loader of a car is compelled to pay whether or not he feels that he derives any benefit from the inspection.

Most of the mandatory *grading* laws are still on the statute books of the respective States in which they were passed although there are some exceptions, Wisconsin and Nebraska particularly having repealed or modified their laws on the subject. Mandatory *inspection* has been tried by Nebraska, Colorado, and Kansas. Nebraska and Colorado each repealed the act after two years of operation. Inspection in Nebraska has since been wholly voluntary. Inspection in Colorado, after remaining on a voluntary basis for two or three seasons during which time about 75 per cent of the shippers formed the habit of obtaining inspection on all the goods forwarded, re-enacted her mandatory law at the request of the industry as a means of preventing certain practices deemed dishonest and unfair. The same reasons which led to the re-establishment of compulsory grading in Colorado led to similar legislation in Kansas, and under a system of local option its extension to the lower Rio Grande Valley of Texas.

It appeared that after a large preponderance of the shipments were going forward under certification obtained through voluntary inspection, certain of the less scrupulous shippers offered uninspected cars of doubtful quality as U. S. No. 1 at reduced prices, hoping that the sales would stick but prepared to make allowances if necessary at point of delivery. These quotations of ostensibly U. S. No. 1 potatoes at less than prevailing f. o. b. prices necessarily had a disturbing effect upon the market and tended to lower unnecessarily the f. o. b. prices for good stock. The compulsory inspection law was designed to put a stop to this practice through the placing in each car of an inspector's card showing the result of his examination of the load.

It remains to be seen whether these acts are forerunners of a system which is to become general or whether they are

merely incidents as the industry feels its way along toward better marketing practices through the method of trial and error. Our department has consistently declined to recommend or approve such legislation. We believe that grades and grading should be aids in marketing and that a grower should do as much grading as anyone will pay him for and no more. In other words, we think it is one phase of the economics of the business which should be left wholly within the field of economics without the interposition of compulsory legislation.

Perhaps I can explain our position in this matter by a specific and accurate illustration. Today most of the potatoes shipped out of the State of Maine are bought and sold on the assumption that they are of U. S. No. 1 grade. Hundreds of cars are shipped to Boston to be sold through brokers. Many of these cars are not officially inspected at point of origin but are inspected by the receivers in Boston to determine whether they are of U. S. No. 1 grade, and if not, the percentage and the character of defects which they contain. At present it is said that a Boston dealer does not dare to divert a car of Maine potatoes through to another market without securing an inspection in Boston which shows that the grade is U. S. No. 1. I recently spent a day in Boston on which our office inspected ten cars of Maine potatoes shipped to Boston in bulk. The buyer or broker in Boston wished to know whether it was safe to divert any of these cars to New York or Philadelphia. It proved that not one of these cars was up to grade, some of them being very decidedly below grade. Therefore they were all sold locally to jobbers who had an opportunity to see the stock before they bought it. The price in Boston was based only in a general way on the value of No. 1 stock. Each car was sold *as is* for the best price which the owner or jobber could obtain. Many of them were no doubt sacked and sold out in 5 and 50 sacks lots. Handled in this way it is probable that those cars which consisted of bright, clean stock within a desirable range brought as much as U. S. No. 1 even though they contained an excess of certain grade defects. On the other hand, stock which was not particularly attractive in its general appearance probably sold for considerably less than U. S. No. 1 because of this same excess of defects.

Our theory of voluntary grading is that the grower or shipper in Maine should have the privilege of shipping this stock to Boston for sale in this way and that no law should compel him to rehandle these goods in Maine and remove enough defective potatoes to bring each car within the No. 1 grade. Neither should he be required to label such stock U. S. No. 1. If a broker in Boston knows definitely that he can place certain cars of U. S. No. 1 Maine potatoes in markets further south he can obtain them by specifying U. S. No. 1 and purchasing

the goods f. o. b. cars in Maine. The Maine shipper can and will not only grade the stock to meet the specifications of U. S. No. 1 but will, if required, obtain Federal-State shipping point inspection and forward a certificate showing that the goods are as ordered.

Here we have the free play of competitive forces. The grower or shipper who thinks it will pay him to put up a strictly U. S. No. 1 article, to endeavor to sell it f. o. b. Maine, or to ship it to his Boston broker with the assurance it can be diverted to any other market as a U. S. No. 1, will follow this practice. The man who feels that he can get more out of his potatoes in the long run by shipping them without such close grading, eventually selling in Boston or other New England markets a good deal of stock which if graded out in Maine must go to the starch factory, is free to do so.

The local situation here in New Jersey seems to me to differ materially from that in Maine. Most of your potatoes come on the market as what we may call the last of the early potato crop. You follow a region extending from Florida to your own State, throughout which grading is being more carefully and generally done from year to year. I presume it is safe to say that a very large majority of the cars shipped from the whole South Atlantic coast are of U. S. No. 1 grade or are specifically No. 2's or No. 3's as understood in Florida. They are not only shipped on a definite basis of grade but there is a general effort on the part of producers and shippers to make the stock conform to the grade, and in most cases the cars so loaded are actually of the grade. The Eastern Shore, as you know, has long enjoyed the reputation for putting up the most carefully graded early potatoes to be found in the markets in which they compete. You follow on the heels of the Eastern Shore, overlapping somewhat with their shipping season, and must compete with a generally well graded product. You are immediately followed by, and your shipping season to a considerable extent overlaps, that of Long Island. And here again you must compete in the New York markets at least with a potato which has for many years commanded a premium and is in definite demand by a large body of your best customers. If New Jersey does not grade her potatoes as carefully as they are graded on both the Eastern shore and Long Island both of these districts will have an added advantage in the competition in all the markets which they reach. Meantime the growing districts in the Central West and Southwest will compete with you on more nearly even terms in the markets of the Ohio Valley and the Great Lakes. With the exercise of the same care in grading, New Jersey potatoes will generally present a better appearance than competing stock from Mississippi Valley districts. If you are to remain a surplus early potato

State it would appear to be good policy to insure for yourselves this advantage which is so easily within your reach.

In recent years we have seen the invasion of the markets by special grades and packs of potatoes. I was impressed with the extent to which these are being tried when I visited in turn almost every important shipping station in Idaho during the first half of October. In one room I saw potatoes coming directly from the car being run through a grader and over picking tables with the result that four different sizes of bakers, each within the two ounce range in weight, were being packed in boxes, while in addition the potatoes not symmetrical enough or not sufficiently uniform in size and shape to meet the exacting requirements of any of these four baker sizes, went off the end of the belt into sacks of U. S. No. 1 and U. S. No. 2. Thus six products, in addition to a few culls, were being obtained out of the stock in the car which as a whole would have been classed as Idaho U. S. No. 1. Each of these six kinds of stock would be sold under a different description and specification as to size, weight, count, or grade. The smallest size being box packed was, I think, a six ounce baker, possibly a four to six ounce. These were going into 15-lb. cartons, the larger baking sizes being wrapped in paper and packed in bushel boxes in every respect like Northwestern apples. I believe that this particular stock was clean but not washed.

In several other houses washing machines have been installed. I saw one of the first of its kind which had been built and installed at an expense of about \$10,000. The process is very similar to the washing and brushing of citrus fruits in Florida. The result was a lot of potatoes so thoroughly cleaned and so much improved in appearance that it is not hard to imagine a very considerable future for the potato washing industry. Most of the washed potatoes are going into special sacked packs, some in 15-lb. cotton, burlap or saxoline bags, others in 25 and 50-lb. bags, some perhaps into carton packs. So prepared the potato is no more objectionable in the kitchenette than is a tree fruit or a head of lettuce. They are no longer dirty things which the dainty housewife hates to handle.

The general feeling in Idaho, as I sensed it, was that the potato washing business was likely to become more general and that the special family packs were likely to be used in considerably larger volume. I could not help wondering whereunto this may lead and whether the housekeeper who lives in an eastern city apartment and who has been handling washed and specially packed western potatoes through many winter months will take kindly to unwashed eastern stock, sometimes dug out of the wet ground and with more or less



dried mud adhering, when the Idaho season draws to a close. I am wondering whether she will be inclined to use fewer potatoes during the summer months and to lean more heavily upon vegetables which are grown above ground until washed stock reappears on the market. Truly no man liveth to himself and no man dieth to himself in the potato business.

Aside from the question of washing we may ask whether the closer grading and more uniform sizing in the small packages designed for delivery to the consumer will lead to a general demand for more careful grading and more uniform sizing of all potatoes. And will this demand be confined to the individual consumer? Will not the larger consumers, the institutions which use potato peeling machinery, become more and more insistent upon such grading as will enable them to buy stock which can be put through the peeling machinery with fairly uniform and satisfactory results? We live in an age when salesmanship has become not only a trade but a profession and an art. Broadly speaking, agricultural products are being sold in a buyers' market. About three years out of four the potato crop is no exception. In the competition for the buyers' favor different shippers, different associations, and different districts may be expected to resort to new sales methods, new advertising schemes, and new manipulations of the product. It would seem that all signs point toward a multiplication of grades, types, sizes, and qualities of potatoes offered to consumers. Just how far each particular district can go with advantages to itself should, as we believe, be determined by economic results and not by legislation.

A new influence has just come into the marketing of the nation's potato crop. On the 12th day of last month the Chicago Mercantile Exchange offered contracts for the future delivery of potatoes. Trading began immediately. Transactions are limited to U. S. No. 1 Idaho Russets with the stipulation that each car tendered for delivery must represent the average type of U. S. No. 1 shipments from that region. The first day 55 cars were sold; the second day 80 cars were sold; and the third day 93 cars were sold. Total cars traded in to date, Feb. 28th, are 586. The prices established on this future exchange will be quoted throughout the country. They are for U. S. No. 1 stock every car of which before delivery must carry a certificate issued after inspection by our department. If future trading in this commodity continues to be as popular as it appears to have been during these first few weeks it is expected that other varieties of potatoes from other districts will also be bought and sold for future delivery on this exchange. It is by no means beyond the bounds of possibility that Irish Cobblers from the Atlantic Coast may be bought and sold for future delivery on the Chicago Mercantile

Exchange before your crop for 1931 has been sold. Every transaction will be on the basis of grade impartially and accurately determined. Inevitably the average trader will wish to buy and sell a commodity which he can tender on the future exchange if it seems advantageous to do so. Inevitably the grower who is not willing to put up a U. S. No. 1 grade will find himself operating in a constantly narrowing market. This narrowing of the market for ungraded, or below grade, potatoes may be not only constant but much more rapid in the future than in the past.

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## Irrigated vs. Dry Land Potatoes

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F. M. HARRINGTON.

Horticulturist, Experiment Station, Bozeman, Mont.

Irrigated and dry land seed potatoes have equal value for planting purposes. This is the substance of results obtained in our tests at Bozeman, the tests being carried for a number of years. In making the statement that they have equal value for seed, I am not implying that irrigated and dry land stocks are the same in all respects, but figured on the basis of equal quantity of seed, the yielding value of the two has proved in our test plots to be practically a standoff. The accompanying table gives a summary of 1930 results, which are typical of results obtained during the entire test period.

Our tests with irrigated and dry land seed have been conducted in two ways. The first test consisted of 10 lots of potatoes. Each lot was divided and one half planted under irrigated conditions and one half on dry land. These lots were grown year after year under the same conditions so as to give either a straight dry land stock or a straight irrigated stock, with the cumulative effects of irrigated conditions or dry land conditions. In addition, each year samples from the dry land plot and the irrigated plot were brought together and planted the following spring under both sets of conditions. This work was carried over a period of six years. Straight field run seed was used in all cases, with no seed selection or roguing of diseased plants. The last year of the test showed but a

very few pounds difference between the irrigated and dry land seed, the advantage being with irrigated seed.

A second phase of this work was carried in connection with the trial tests of certified seed samples. Each grower of certified seed is required to submit a sample of his stock to be planted at the experiment station. This sample is divided, a third planted on dry land four miles from Bozeman, another third on irrigated land at Bozeman, and the last lot on irrigated land at the Horticultural Branch Station, Corvallis, Montana. Records are available of each of these samples, showing whether the stock was originally grown under irrigation or on dry land. The results of the work in 1930 are typical of results throughout the entire test. These indicate that buyers have an equal chance in using irrigated or dry land seed potatoes.

Aside from yield comparisons there are points favoring either the one or the other of these two types of seed. The size of tubers produced under the two sets of conditions furnishes an outstanding contrast. Tubers produced under irrigation uniformly average larger in size. But when you consider that potato yields are to a great extent in accordance with the total quantity of seed planted, the somewhat larger tubers furnish no economic handicap whatsoever. Extremely large tubers, running to a pound or better, of course do not constitute as economical seed stock as some of the smaller sizes. In cutting extremely large tubers there is exposed on the cut seed pieces a much larger cut surface, which under many conditions of planting is not desirable. It is possible, however, to control the size of tubers, even under irrigation.

Another point of difference noted in the two types of producing seed potatoes is the ease with which diseased plants can be spotted in the irrigated field. Since our irrigated and dry land fields at the experiment station are only four miles apart, conditions are essentially the same except for the application of water in the one plot. This season, which was especially dry, it was noticeable that slight infections, particularly of mosaic, were extremely difficult to locate in the dry land field, but were easy to find in the irrigated field. In comparing the disease readings of the various lots, both under irrigation and on dry land, we found that the disease readings showed a higher percentage for the irrigated field than for the dry land plot, indicating that in our disease work we are locating a higher percentage of diseased plants in the irrigated test.

For all practical purposes, therefore, we maintain that there is no marked difference in the value of seed potatoes grown under irrigation and on dry land.

## IRRIGATED VS. DRY LAND SEED POTATOES, 1930

## BLISS TRIUMPH

Test Plot	Type of Seed	Acre Yield
Dry Land .....	Irrigated	6,267
	Dry Land	6,947
Irrigated .....	Irrigated	24,235
	Dry Land	23,241
Average Irrigated Seed .....		15,251
Dry Land Seed .....		15,094

## NETTED GEM

Test Plot	Type of Seed	Acre Yield
Dry Land .....	Irrigated	7,452
	Dry Land	7,651
Irrigated .....	Irrigated	19,877
	Dry Land	20,242
Irrigated* .....	Irrigated	24,714
	Dry Land	23,962
Average: Irrigated Seed .....		17,347
Dry Land Seed .....		17,285

\*Test plot at Corvallis, Montana.

## Potato Outlook Committee

Report of the Pacific Northwest Potato Committee  
H. E. DROBISH, Secretary, Boise, Idaho

In the opinion of the committee representing the principal potato producing states in this western area, present indications are for an increased planting of potatoes in these states in 1931 as compared with 1930. A more reliable guide will be the intentions-to-plant report which will be released by the Department of Agriculture in February.

From past experience the present state of mind of the growers indicates an increased planting will be modified by the trend of prices for the balance of this crop season.

Growers of potatoes in the early states, extending along the coast from southern Texas to and including North Carolina, reported in October that they intended to plant, for harvest next spring, a combined acreage about 10 per cent larger than that harvested in 1930, which was the second highest on record, and only about 6 per cent less than the excessive acreage of 1928. Reports from growers in Arkansas, Oklahoma and Tennessee indicate that these states are planting an acreage 15 per cent larger than that of 1930, but still 26 per cent below the record of 1928.

California, an important market for western potatoes, reports intentions to plant 19 per cent more early potatoes in 1931 than 1930. This amounts to an increase of 2,430 acres.

Storage stocks in most western states at the present time are heavy as compared with 1929.

Present prices for this season's crop to date are much lower than last year despite only a small percentage increase in total United States production. Indications are that the effect of poor business conditions, responsible in part for the comparatively low prices of potatoes this year, will not be entirely removed in 1931.

The largest total returns to farmers for potatoes in the United States has been received in those years of lowest total production. When total production in normal business years has equalled or exceeded 400,000,000 bushels the price has been unsatisfactory.

Following the extremely heavy production of 1928 there was a substantial reduction of acreage in 1929 and a slightly increased acreage in 1930 over 1929. However, if the average production for the preceding 5-year period, 1924-28 inclusive, had prevailed in 1929 and 1930 the total crop from the acreage planted would have been close to 400,000,000 each year. If such a production had occurred this year, 1930, indications are that the supply of potatoes would have been in excess of consumptive requirements and the price would have been below cost of production. Drought conditions in Minnesota, Wisconsin and Michigan caused this much smaller production in 1929 and 1930. If average production is secured in these states in 1931 there will be much stronger competition in middle western markets for shipments from the far western states.

A comparatively small percentage increase or decrease in total production results in a much larger percentage decrease or increase in price. For example, in 1926 the growers received 50 per cent more per bushel than in 1927 although the total production in 1926 was only about 12 per cent less than



in 1927 (page 765 Yearbook 1930). The Western states produce a surplus market beyond local needs which makes necessary shipments to middle western markets. As compared with the eastern or middle western farmers, the western grower is at a disadvantage due to a higher freight differential approximating 40 cents per cwt. A limited market has been developed which will pay a substantial premium for the western Russet potato and certain special varieties because of good grading and recognized superior quality for certain food purposes.

The price in Pacific Coast markets is largely determined by the price received by Idaho and Colorado for their eastern shipments.

The average yearly premium on western Russets in the Chicago markets as compared with round whites during the past 10 years has varied from 16 cents to \$1.22 per cwt. This premium for Russet potatoes has been greater in those years when the western states produced a smaller proportion of the total United States production. Conversely, the tendency has been for the premium to be smaller when the western states produced a larger percentage of the total United States production. For example, in the crop season 1927-28 the per cent of production in the western states was about 20 per cent of the total United States production. The premium for Russets averaged only 16 cents per cwt. In the crop season 1928-29 the percentage of production in the western states was less than 15 per cent of the total production and the premium for that year averaged 65 cents per cwt.

Therefore, a limitation of production of Russet potatoes in the west, regardless of the total production in the rest of the United States, has been reflected in an increased return to the western producer.

### CONCLUSION

If the same acreage is planted in 1931 as was planted in 1930 and only average yields are secured, the production will exceed 400,000,000 bushels and comparatively low prices will probably result.

If an increased acreage of the late crop is planted in 1931 equivalent to the indicated increase of 10 per cent reported for the early states, and average yields are secured, a production approaching the record yield of 1928 will be the result. Prices were disastrously low for the 1928 crop.

In the opinion of the committee any attempt to reduce pro-

duction for 1931 should be brought about by planting less acreage, particularly in those areas where soil and climatic conditions are unfavorable for the production of the highest yield of quality potatoes.

From the market outlook for the season of 1931-32, those growers whose total costs of production and marketing are above the average, should seriously consider before investing money in potato production for the coming year. The present outlook does not justify speculative planting. The committee recognizes that there are special areas of unusually low cost of production and proximity to market where a reduction in acreage cannot be expected.

Good farming practices and increased efficiency should be encouraged. The use of good seed, sufficient fertilizer and proper cultural practices are necessary in securing the highest yield of quality potatoes. The resulting low costs per unit of production are equally important, regardless of the market outlook in any given year.

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## Crop and Market News

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### Potato Holdings Estimated

(Contribution from the Bureau of Agricultural Economics)

Holdings of merchantable potatoes on January 1 in 35 late States together were 88,954,000 bushels, or scarcely 1% less than a year ago. The 19 surplus States which make most of the shipments had 81,370,000 bushels, or about 1% more than their holdings of last season. East and North the holdings were lighter than a year ago, but an excess of 28% appeared in the West. The 16 deficient late States had about 15% fewer potatoes than in January, 1930.

Shipments from January 1 to February 10 were around 25,000 cars. Daily movement was averaging 700 cars. The entire market situation was rather weak. The f. o. b. level in Northern Maine held around \$1.25-\$1.30 per 100 pounds sacked, but prices in Western New York declined to \$1.35-\$1.40 and the North Central f. o. b. range was \$1.10-\$1.25 in early February. Most carlot sales in western shipping districts were being made at 70c-\$1 per 100 pounds. The Chicago car-

lot market was lower on northern Round Whites at \$1.15-\$1.35, with Nebraska Bliss Triumphs selling at \$1.50-\$1.60 and Colorado and Idaho stock at \$1.50-\$1.75. "Futures" on Idaho Russets for March delivery averaged \$1.56 per 100 pounds and for April delivery \$1.62. New southern potatoes were jobbing generally at \$1.50-\$3 per 50-pound sack or \$1.75-\$2.75 per bushel package. Bermuda barrels brought \$8-\$8.50 on the New York market.

### Utilization of Potatoes

Of the estimated 324,741,000 bushels of potatoes produced in the 35 late or main-crop States last year, about 64% was estimated to be of U. S. No. 1 grade, compared with 68% in 1929. Nearly 8% was reported to be unfit for either food or seed, which was a considerably larger percentage than for the 1929 crop. About 18% of the crop in these States, or 58,713,000 bushels, was saved by growers for food on their own farms. This is slightly more than was so used from the 1929 crop. The quantity held for local seed requirements was 34,375,000 bushels, or about 11% of the late crop. This also is a little more than was saved for seed from the crop of 1929. Thus a total of 206,193,000 bushels, or 63% of the late crop, remained available for sale at harvest time, but only 88,954,000 bushels of that quantity were still available on January 1. Holdings in Canada on January 1 were 2,837,020 cwt., or nearly 10% less than stocks of a year ago, though production was almost one-fourth heavier than in 1929.

### Outlook for 1931

The potato outlook report for 1931 indicates the probability of lower prices this year than last, if growers plant the increased acreages which they evidently intend to plant and if average weather conditions prevail. In case the total potato acreage shows a general increase of 6%, with normal yields the 1931 crop may amount to 421,000,000 bushels, compared with an estimated 1930 crop of 361,000,000 bushels.

The early potato acreage planted in Florida and the Lower Valley of Texas for the 1931 season is estimated to be 7% smaller than in 1930 but nearly one-fourth larger than the average acreage in these areas during the previous five years, 1925 to 1929. Combined with the greatly expanded fall-crop acreage in Texas, the plantings in the two States have been only slightly less than last year.

Growers in six other early States and in the East Texas area now expect to have a combined planting of commercial early potatoes about 15% greater than in 1930. If these plans

materialize, Louisiana will show an increase of one-fourth, Alabama and California about one-fifth and East Texas about one-tenth. Minor increases are being considered in Mississippi and South Carolina, while Georgia acreage will probably remain unchanged.

Earlier reports of the plans of growers in the second-early and intermediate States have previously been announced, the second-early States indicating a probable planting not quite 2% larger than in 1930 and the intermediate States an intended planting about 5% larger.

Growers in Virginia appear to be planning an acreage about 4% smaller than that grown last season. From present indications, both the Norfolk and Eastern Shore areas will have about the same percentage of decrease. The Maryland acreage, which is contiguous to the Eastern Shore of Virginia territory, is expected to be 3% below the 1930 acreage. New Jersey, however, is planning a 6% increase. In Kentucky, present prospects are for an acreage 20% less than that of last year, due to scarcity of home-grown seed and the uncertainty of financing. Other mid-season States—Kansas, Missouri and Nebraska—are planning increases ranging from 3% to 13%. The combined expected acreage in these 19 States is 350,580, as against 334,390 acres last season and a previous five-year average of 320,144 acres.

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## Certified Seed Potato Production Smallest in Four Years

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Production of certified potatoes, amounting to approximately 6,283,924 bushels, was about 25% smaller in 1930 than in 1929, according to information obtained from state certifying agencies by the U. S. Bureau of Agricultural Economics. Production was about 40% smaller than in 1928, 10% smaller than in 1927 but was 25% larger than in 1926.

As in recent years, Cobbler, Green Mountain and Triumph were the leading varieties certified. Some of the other varieties in order of quantity certified in 1930 were Spaulding Rose, Russet Rural, Netted Gem, Rural, and Early Ohio.

Early movement was a trifle slower than last year and prices to growers averaged about 40c a bushel lower than a year ago, when they were \$1 higher than the year before.

—HAY, FEED & SEED DIVISION.

Passing the 1,000 car mark, futures trading in potatoes on the Chicago Mercantile Exchange continued actively through the first half of February. The price trend has been lower, influenced by a rapidly weakening spot market and the fact that shipment news has indicated a somewhat slow movement, in view of stocks on hand.

Idaho Russet Standards for March delivery started out the month at \$1.72 but closed February 16 at \$1.57. April delivery opened at \$1.75 and closed February 16 at \$1.60. With the spot market drifting lower, handlers have been quick to take advantage of the higher prices prevailing on the exchange to place sales. This has brought in pressure and resulted in the drop, buyers being inclined to watch the market for a time.

Sentiment continues somewhat bearish for the time being, although many traders predict a forward turn before the end of this month. This slightly bullish attitude for the longer pull was engendered largely by the fact that heavier shipments began to be noted. Naturally, if shipments are heavier and indications therefore point to rapid reduction of supplies before March or April, the futures would firm up.

At the close February 16, there had been 375 cars sold on the futures boards during February, bringing the total for the life of the exchange trading to 1,053 cars.

## INOCULATED SULPHUR

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If you plant potatoes in soil that is infested with scab, you can be certain of a clean crop if you apply Inoculated Sulphur before planting. This fact has been proved by repeated tests by experiment stations. Inoculated Sulphur is a discovery of Dr. J. G. Lipman, of the N. J. State Experiment Station, and we are sole licensees under his patent.

**Inoculated Sulphur increases yield and controls Pox, Scurf and Black Rot of sweet potatoes.**

**Circulars on request.**

**Mechling Bros. Chemical Co.**

**Camden**

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## Notes

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### MICHIGAN

The Michigan State Potato Show held during Farmers' Week, February 2-6, 1931, was not lacking in quality of exhibits despite the drought. One hundred and sixty-five entries were on display, representing the winning samples from a total of 1100 entries exhibited at the five district Potato Shows held during October and November, 1930.

First place in Russet Rurals and sweepstakes honors was won by Frank Guy of Pellston. Reisener Bros. & Hoppe, of Hawks, won first place in certified Russet Rurals. First place in the open Irish Cobbler class was won by J. D. Robinson of Pellston. Emmet county won first place in county exhibit.

#### Premier Grower Contest

Reisener Bros. & Hoppe of Hawks, won final honors in the first State-wide Premier Potato grower contest in Michigan. This contest is designed to select the outstanding potato grower in Michigan each year, a selection based upon yield, quality, showing ability, grading ability, and cost of production. The winner receives a trip on an extended potato tour outside of the state.

—J. J. BIRD.

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### PENNSYLVANIA

The Pennsylvania Potato Growers Association held its annual meeting on January 21 and 22 inclusive. This was during the week of the annual State Farm Products Show which was held in the new \$1,500,000 Show Building at Harrisburg. This building covers approximately 10 acres of ground.

The potato growers spent Wednesday morning, January 21, visiting and studying the exhibits of potatoes and potato machinery that were shown in the new Show Building. Questions relating to machinery and equipment were later discussed at the regular meeting.

Wednesday afternoon was spent in discussing methods of production with particular emphasis on high analysis fertilizers and lime in the potato rotation. Dr. Firman E. Bear,

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Successful farmers even *add* a little to initial costs in order to cut final costs! They buy and use tons of V-C fertilizer—and produce pounds or bushels or other units in greater number per acre and man-hour, thus cutting the cost each unit must bear.

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Director of Agricultural Research for the American Cyanamid Company, gave an interesting talk and led the discussion on fertilizer while P. H. Wessels of the New York State College and Agricultural Experiment Station led the discussion on lime in the potato rotation.

Professor J. B. R. Dickey of the Pennsylvania State College pointed out to the growers the various lessons to be learned from the methods followed by the 400-bushel growers for 1930. Last year there were 50 potato growers who grew 400 bushels or more on their best acres. More than 100 growers failed to make the 400-Bushel Club by less than 25 bushels per acre, due principally to the dry weather conditions during the growing season. Victor A. Houston of the Allentown State Hospital Farm led the state last year with a yield of 603.3 bushels. Twenty-three of these growers grew 400 bushels last year for the first time.


Over 400 growers and their wives attended the banquet on Wednesday evening. The guests were entertained with rhyme, music and potato jingles.

## Eureka Potato Machines

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Eureka Potato Machines take hard work out of potato growing. They reduce time and labor costs. They assure bigger yields.

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**Riding Mulcher**  
Breaks crusts, mulches soil, and kills weeds when potato crop is young and tender. 8, 10 and 12 ft. sizes. Many other uses, with or without seeding attachment.

**Potato Digger**  
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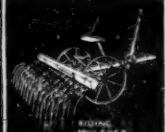
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## EUREKA MOWER CO.

## Utica, N. Y.

Thursday morning was spent in discussing potato markets in Pennsylvania. This discussion was led by George A. Stuart and D. M. James of the Pennsylvania Department of Agriculture. Part of this session was also devoted to discussing the new developments and new features in potato machinery. These discussions were led by men connected with the prominent commercial potato machinery companies. Thursday afternoon an open forum was held and such features as stem end rot, spray lime, seed treatment, etc., were discussed. This discussion was led by no other than Dr. E. L. Nixon, himself.

The meetings this year were attended by more than 500 growers.

The potato exhibits shown were of very good quality and included 283 individual displays. Twenty-eight of these were shown by the 400-bushel growers who exhibited potatoes produced on their 400-bushel acres. The grand champion honors this year went to Walter Schlegal, Bath, Northampton County. Mr. W. A. Westrick of Patton, Cambria County, won the sweepstakes in the certified seed potato class.

—K. W. LAUER.

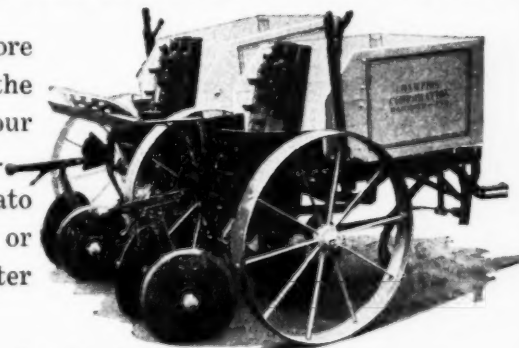
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## OREGON

The planting of small seed, or as it is called here, "single drop" seed, has been a common practice for many years, and ever since our certification work was started in this state, we have recognized this small seed as valuable, and accordingly have issued tags for it. Our practice is to use the same certification tag that is used with the larger seed, and stamp "Single Drop" across the face of both sides of the tag, usually with a different color of ink so that it would show up easily. In some cases the growers merely write "Single Drop" across the face of the tag in the same way.

This has worked out very satisfactorily, as we do not have to use any different kind of tags, and all of the growers, both in this and in neighboring states, are now pretty familiar with the practice.

While on this matter of cut versus whole seed, an increasing number of our folks here are using the suberizing method for their cut seed. Most of our growers all over the state prefer the single drop seed, but in many cases it is not possible for them to use all whole seed. This is particularly true of our seed growers who want to use the entire product from a seed plot for their large fields next year. These people therefore have many No. 2's and also large potatoes which they are going to use for seed. In this case they cut the potatoes about 48 hours ahead of time, store them in a dark place, and sprinkle them several times a day with water. Under our conditions, at least, this suberization process has pretty well done away with the trouble from rotting when cut seed is used. The practice is not universal among the growers, of course, but still a large number are now using it and the number is increasing.

—E. R. JACKMAN.

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## FLORIDA

The peak of the planting in the Hastings section was from a week to 10 days later than usual, most of the seed being planted the last two weeks in January and planting was completed the week of February 7th. LaCrosse section planted their acreage the last two weeks in January and were through by the first of February. Harvesting of the South Florida acreage has started and shipments will increase this month. There was some planting done in January in such later sections as Plant City, Arcadia, Wachula, etc. (Feb. 10).



## Review of Recent Literature

**Bushnell, John.** Rate of planting potatoes with some reference to sprouting habit and size of plants. Ohio Agr. Exp. Sta. Bul. 462, 20 pp., 3 figs. Oct. 1930.

A brief review is presented of previous literature on size of seed pieces and spacing of hills and the deductions therefrom. The author made a comparison of 1 and 2-ounce seed pieces at various distances between hills using the Russet Rural variety. Spacing between hills in a planting made April 20, 1926 varied from 3 to 15 inches, while in one made June 1, 1926 the range of spacing was 3 to 18 inches. The spacings increased by increments of 3 inches in each planting. Both plantings were made in duplicate. One planting in triplicate was made May 23, 1927 with hill spacings of 6, 9, 12, 15 and 24 inches. Two plantings were made in 1926. The first in quadruplicate on



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POTATOES  
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April 21 and the latter in duplicate on June 1. The plant spacings in each case were 6, 9 and 12 inches. It was found that at any uniform spacing the 2-ounce pieces usually out-yielded the 1-ounce sets, both marketable and total weight of tubers. Deduction of weight of seed used, however, indicated that there was no consistent superiority in yield of one size of seed piece over the other. Close spacing of hills increased the total yield but gave a larger proportion of small tubers. Highest net yields were generally obtained from 9 and 12-inch spacings, but neither size seed piece was consistently superior to the other at either of these spacings.

A study of the effect of multiple sprouting was made in 1928 in connection with the two plantings made in the size of seed piece test. One-ounce seed pieces planted on April 21 averaged 1.24 sprouts, while those planted June 1 averaged 1.71 per set. A similar comparison of the behavior of the 2-ounce sets gave an average of 1.72 and 2.65 sprouts per set. Multiple sprouting resulting from treatment of seed pieces with thiourea when compared with untreated seed showed that the untreated seed increased in yield with closer spacing of hills, while the treated seed did not, indicating that a wider spacing should be given multiple sprouted sets. A comparative study was made between  $\frac{1}{2}$ , 1,  $1\frac{1}{2}$  and 2-ounce seed pieces to determine most profitable weight of seed piece to use. The  $\frac{1}{2}$ -ounce set even when closely spaced did not give as large a yield as ounce pieces properly spaced and the plants were noticeably smaller throughout the season. The author's conclusions with respect to size of seed piece is that the most economical procedure is to use a 1-ounce set spaced 9 to 12 inches apart in the row.

—W. STUART.

